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ABSTRACT

The three track method of teaching amputees to ski is presented in the illustrated manual. Problems unique to amputee skiers--care of hands, conditioning, care of stump, fatigue, excessive standing, wind, and balance--are discussed in terms of their implications to the amputee skier and practical solutions in attempting to solve them. Specific performance goals and step-by-step progressions are presented for walking; falling; getting up; hop turns; sidestepping; straight running; stopping; riding chair, T-bar, and Poma lifts; traverse; uphill Christy; Christy turn; Christy with preturn; and shortswing. Both pictures and drawings of the outrigger ski are included. (Author/DB)

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the winter park amputee ski teaching system

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the winter park amputee ski teaching system©

by hal o'leary

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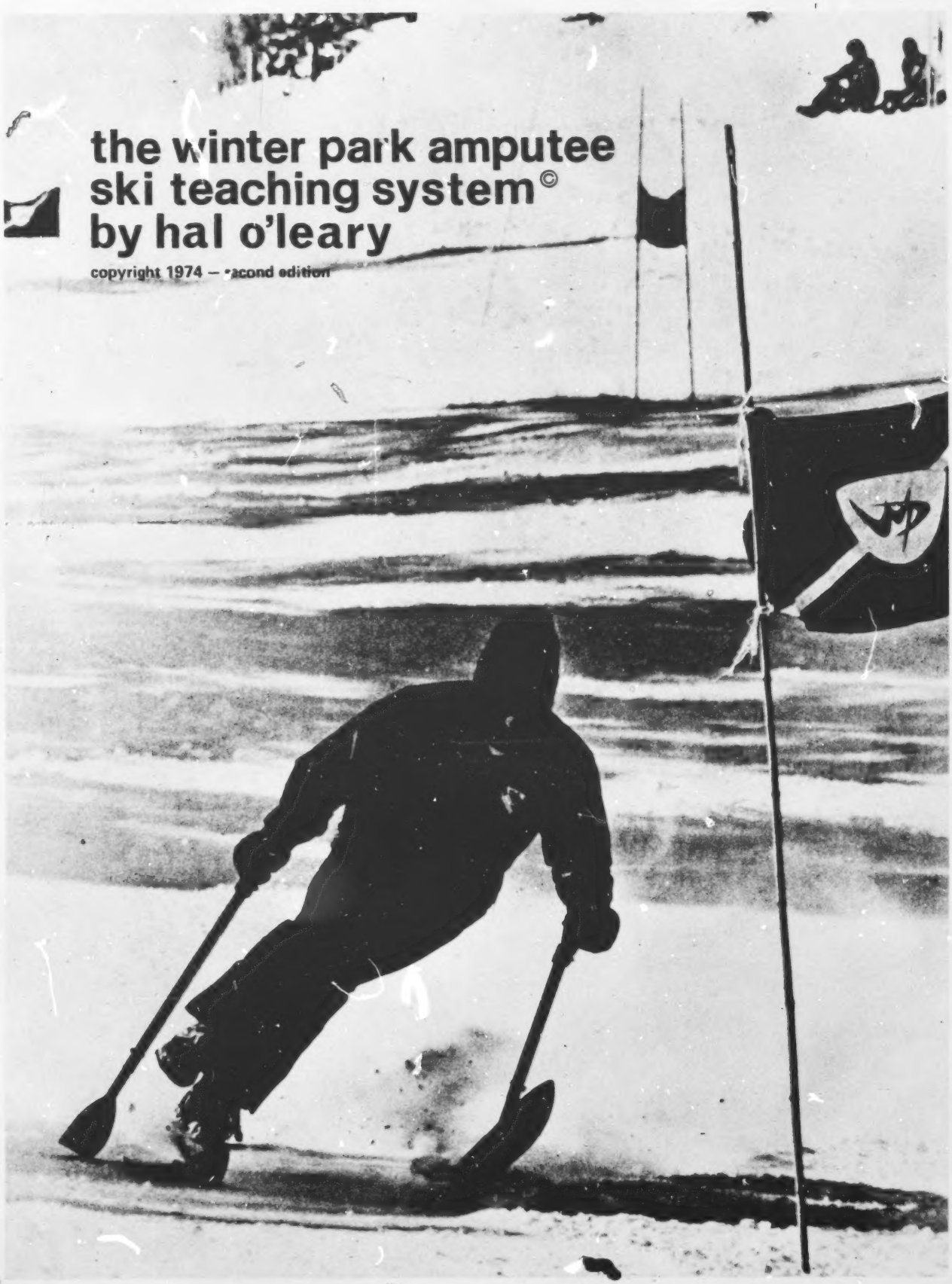


PREFACE

Someone once said, "If God had meant us to ski, he would have given us feet with metal edges."

As every instructor knows, learning to ski is essentially mastering the use of special equipment and highly developed skills to overcome various natural difficulties. The skier uses attachments called skis to compensate for the inadequate length of his feet. He uses special boots as a supporting prosthesis to overcome the inadequate rigidity of his ankles. A skier must develop skills to keep him upright against the pull of gravity. When you consider the problems we have to overcome, we're all handicapped skiers.

Hal O'Leary
Supervisor of Amputee Teaching
Winter Park, Colorado

INTRODUCTION

Skiing is an enormous delight to the amputee, not only for the usual reasons but because, through skiing, the amputee can move with speed, grace and ease. He enters a new world of freedom and competes on an equal plane with two-legged devotees of the sport.

The Three Track Teaching Method developed at Winter Park is based essentially on the principles of the PSIA American Teaching Method with the exception of stemming skills. Our system puts much emphasis on down-unweighting in the advanced stages and concentrates on educating the foot for a powerful "steering" action of the ski. Turns are initiated using "anticipation" and the result is a smooth, fluid technique.

The Winter Park Technique didn't just happen. It required many hours of experimentation, careful analysis, critical observation and the efforts of certified ski teachers to develop the system to its present state-of-the-art.

It also required the understanding and cooperation of Winter Park Ski School Director, George Engel, who provided instructors for the experiment. Thanks are also extended to the Winter Park management for providing free lift tickets and other considerations to our pilot group, Denver Children's Hospital's Three Track Ski Club.

Unlike some amputee teaching techniques, the system used to train skiers at Winter Park results in a rhythmical style. There is nothing stiff or static about their relaxed form. But more importantly, their skiing is fundamentally strong, aggressive and dynamic. They have used their distinct style to win races and ski in full control on the steepest, most challenging terrain to be found. We are proud of our amputees. They are beautiful skiers.

GENERAL TEACHING GUIDELINES FOR AMPUTEE SKIERS

All students come to ski school with handicaps – both physical and mental. They may fear heights, falling, being hurt or any of a dozen other psychological hangups. The amputee student, like every other beginner, shares these problems plus the physical difficulty of having only one leg.

From a teaching standpoint, instructors must develop empathy – the ability to feel what the student is feeling – if the technique is to work. Over-riding sympathy and pity are destructive and must be avoided. Instructors should use firmness, flexibility and humor in training amputee skiers in the same degree as with other students. There are some special problems unique to amputees, however. The following notes represent observations we have made:

CARE OF THE HANDS:

Using outriggers, the three track skier puts constant pressure on his hands. Consequently, blood circulation is impaired and the hands get cold easily. Suggest mittens since they are warmer than gloves. If hands do get cold, take time out to perform the standard maneuvers for restoring circulation; Swinging arms vigorously, shaking the hands from the wrists and beating hands together.

CONDITIONING:

It is most important that the amputee's sound leg be in good condition before he starts skiing. Recent amputees should follow a program of leg-strengthening exercises. They should consult their physician or the physical therapy department of their local hospital.

CARE OF THE STUMP:

Because blood circulation at the site of the amputation is often poor or impaired, the stump should be protected against the cold with a wool stump sock or heavy wool stocking pulled over and fastened securely. Padding the stump will provide additional protection against the cold and possible discomfort in falls. From a Prosthetists, the amputee can obtain a special stump shell made of light, molded plastic to be worn over the sock and under the ski pants. The student should be told to keep moving his stump while riding the chairlift, flipping it regularly against the seat to help maintain circulation.

FATIGUE:

A beginning skier can become fatigued after one or two runs. He should be encouraged to rest as often as seems helpful by sitting down in the snow – off the trail -- and getting weight off his leg. A burning sensation in the leg is a symptom of muscle exhaustion. If not alleviated immediately, the muscles may give out completely and the leg will collapse.

EXCESSIVE STANDING:

The instructor must not expect or require an amputee to stand for long periods. Standing requires that all or most of the weight be borne on one leg and it will tire quickly.

WIND:

Like all skiers, the amputee will tire faster when skiing in a strong wind. Even the older, stronger skier will have to exert a great deal more effort than normal to maintain balance and younger, smaller skiers can literally be blown down!

BALANCE:

Most three trackers ski without their prosthesis. The artificial limb hampers the ability to maintain balance and shift weight. Some amputee skiers – those with below the knee amputations – prefer to wear the prosthesis, tucking the foot up and out of the way. During all maneuvers, the student should hold his stump firmly against his leg. The stump should not be permitted to fly away from the body.

In training amputees, the instructor uses outriggers and skis on one leg using one ski, just as his students do. His other foot is held firmly out of the way against his skiing foot.

WALKING

Goals: Familiarization with equipment.

Progression:

1) Place outrigger tips shoulder-width apart, even with heel of ski boot. Turn tips out at a forty-five degree angle.
2) Flex the knee. Upper body is bent slightly forward.
3) Using the inside edges of the outriggers, push off with the arms.
4) Follow through with a backward thrust of the arms. Finish with the body upright, in a position to repeat the maneuver.
5) Practice until a rhythm is developed. The beginner should use short "steps", lengthening them as experience with the maneuver increases.

FALLING

All novice skiers should be taught how to fall properly. They should also be told that it is not always possible to plan a fall thoroughly. When the student finds that he can no longer keep his balance, he should try to control his fall as much as possible by doing the following:

Progression:

1) Lower or drop the body until the buttocks contact the snow.
2) In a continuous motion, lift the outriggers up and out, and place them uphill on the snow behind and on either side of the head.
3) Keep the back of the head up and off the snow.
4) Lift the leg skis and the stump off the snow and hold them up.

GETTING UP

Progression:

1) The stump is positioned uphill since the student will find that it is easier to get up on his stump side.
2) The leg ski is placed across the fall line. The ski tip of the uphill outrigger is placed parallel with the leg ski.
3) Rest the downhill buttock on the heel of the boot. Then bend forward at the waist to get the weight over the legs.
4) Grasp the shaft of the uphill outrigger with both hands, placing the uphill hand at the bottom and the other about three-quarters of the way up.
5) Now push up and forward until the thrust of that motion brings the body back to the upright position.

HOP TURN I

Goals: Change of direction. Rhythm.

This maneuver is taught and practiced on the flat. When mastered, it is used as the basis of the hop-turn.

Progression:

1) The outriggers are anchored firmly in the snow with their tips turned slightly in at forty-five degree angles ahead of the toe of the boot.
2) The knee is flexed and the upper body is bent slightly forward.
3) Using an up-motion, hop the tail of the leg ski to one side. Use enough "up" motion to just clear the snow. As this maneuver is repeated with short hops, the leg ski will leave a fan-shaped track. The angle of the outrigger skis remains constant with the leg ski.
4) At the completion of each hop, the tail of the leg ski should land gently on the snow. A slight down-motion, keeping the knee flexed, will absorb the shock of landing.
5) It is important that the student remember to use at least one outrigger constantly to maintain his balance.
6) The instructor may help the student master this maneuver by firmly holding down the tip of the student's leg ski on the snow, thus ensuring that only the tail of the leg ski is hopped.

Discussion:

At this point, the hop-around turn is taught only as a means of changing direction while in a static position. Later, the hopping skills will be used to initiate turns.

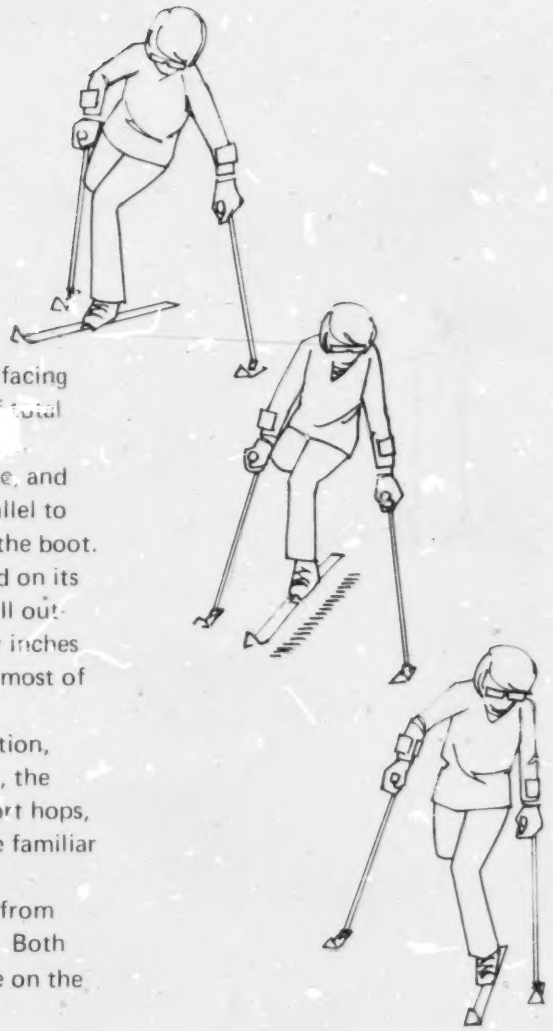
The student must develop rhythm and balance and become familiar with the arm/foot coordination needed to use the outrigger. This is a "confidence building" stage so move the student evenly but not too fast.

SIDESTEPPING

Goals: Rhythm, balance, edge control.

Progression:

1) The student sidesteps with his stump facing uphill. The starting position is one of total flex in the ankle, knee, and upper body.
2) The leg ski is placed across the fall line, and both outrigger ski tips are placed parallel to the leg ski, on a line with the heel of the boot.
3) The downhill outrigger ski is anchored on its inside edge near the leg ski. The uphill outrigger is placed approximately twenty inches from the leg ski. The outriggers bear most of the weight.
4) With a slight forward and upward motion, hop the leg ski laterally uphill. Again, the beginning student should use very short hops, lengthening them as he becomes more familiar and secure with the maneuver.
5) Edge control, the ability to keep skis from slipping, must be explained carefully. Both the leg ski and downhill outrigger ride on the uphill edge.



STRAIGHT RUNNING

Goals: Balance while slipping.

Progression:

1) The terrain should be gentle, smooth, packed and have a flat run-out.
2) With leg ski across the fall line, outrigger skis are firmly anchored on their inside edges near the tip of the leg ski at an angle slightly short of ninety degrees.
3) By making short, uphill hops, move the tail of the leg ski around until its tip is pointing downhill. With each hop the outriggers are adjusted as needed to maintain their relative position to the leg ski.
4) In a slow and even motion, holding the outriggers apart at shoulder distance, turn the outrigger skis until they are parallel to the leg ski, positioned halfway between the tip of the leg ski and the toe of the boot.
5) In anticipation of the downhill run, the ankle, knee, and upper body are flexed. The weight is maintained forward.
6) It is important that most of the body weight be carried by the leg. The outriggers are used for balance only and they remain on the snow throughout the entire maneuver.

Discussion:

Watch that the student remains balanced and relaxed on the leg ski. Outriggers are used only for additional stability and as "confidence crutches." Body weight should not rest on them. As the student becomes familiar with the new sliding sensation, let him do simple exercises like flexing the knee, hopping, lifting the outriggers and rocking back and forth. The goal is to keep the student loose and relaxed while developing confidence.

STOPPING

Progression:

1) While student is sliding, initiate the stop by lowering the body, i.e., bend the knee, ankle and upper body forward.
2) Keep the hands below the hips and extend the outriggers forward beyond the tip of the leg ski until the tails of the outriggers are biting into the snow. At this point, the tips of the outriggers will be wholly off the snow, pointing skyward.
3) Bear down firmly on the tails of the outriggers until an effective braking resistance against the snow is achieved.

Discussion:
This maneuver effects a slow stop, and is taught to the beginner before he learns turns. It is especially helpful in enabling the novice to come to a halt in the unloading zone after his first ride on the chair-lift. It serves the same function as a straight snowplow stop in building the student's confidence.

RIDING THE LIFT

A) Chair-lift

Progression:

1) Stand in the loading zone of the chair-lift with the leg ski pointing directly ahead.
2) Look over the shoulder to watch the approach of the chair.
3) Do not remove the outriggers. As the chair approaches, lift them up and straight out, keeping the leg ski pointing straight ahead.
4) Bend the knee and sit down as the chair moves under you.
5) Leave the leg ski on the snow and continue holding the outriggers up until you have left the ground and are in the air.
6) As the chair approaches the unloading ramp, lift up the tip of the leg ski and both outriggers. Do not have the chair stopped. It is extremely difficult for an amputee to disembark unless the chair is moving.
7) As the chair moves over the ramp of the unloading zone, put the leg ski down on the snow and lower the outriggers, shoulder-width apart. Unload just as the chair reaches the lip of the unloading ramp.
8) Lean forward at the waist, bend the knee, and stand up, immediately placing the outriggers on the snow for balance. It is essential to keep leaning forward. The weight of the body is borne by the leg; outriggers are used for balance only.
9) Ski down the unloading ramp by assuming the straight running position. Use the tails of the outrigger skis to stop. Move quickly out of the unloading zone.

B) T-Bar Lift

Progression:

1) Remove the inside outrigger and hold it by its shaft between the thumb and forefinger. The outside outrigger rides on the snow for balance. Since the attendant places the T-bar in position, it is not necessary to watch the approach of the bar.
2) As the T-bar is placed under the buttocks grasp the center pole of the T-bar with the fingers of the inside hand. Be prepared to maintain balance.
3) The knee is flexed, the leg ski carries the body's weight, and the outside outrigger rides on the snow for balance only.
4) UNLOAD at the point indicated. Begin to release the T-bar by moving the hips to the outside. Hold onto and guide the center pole until the arm is fully extended. Then let go gently in a motion like that of rolling up a window shade, permitting the T-bar to re-track.
5) After letting go of the T-bar, replace the inside outrigger on the arm. Assume the straight running position and ski out of the unloading zone as quickly as possible.

C) Poma Lift

Progression:

1) Both outriggers, held apart at shoulder-width, ride on the snow for balance only. Weight is carried wholly by the leg. Since the skier uses his outriggers for balance, he does not hold onto the center pole of the poma.
2) As the poma disc is placed between the leg and stump, the skier should be prepared to maintain his balance through the sudden movement often typical of the start of this kind of lift.
3) He should then relax and let the lift do the pulling.
4) UNLOAD at the point indicated. To release the poma disc, the skier lifts his stump outward, away from his body.
5) The skier should be aware that the poma is capable of a slight back-thrust when released in this manner. Since he is not controlling the release by hand, he should immediately slow down by braking with his outriggers as he skis down the release area, so that his speed is less than the poma's, enabling the bouncing poma to pass him and go its way.
6) Ski out of the unloading zone as quickly as possible.

NOTE: Amputees with no stump will find riding a poma lift extremely difficult.

TRAVERSE

Progression:

1) Choose gentle, wide terrain. As the student crosses the slope, the outriggers are held shoulder-width apart and parallel to the edged leg ski. The ankle, knee, and upper body are slightly flexed.
2) The uphill outrigger is slightly advanced and weighted. The downhill outrigger is held in its track by exerting slight pressure on it.
3) Angulate slightly using a lateral movement of the knee into the hill to maintain the edge of the leg ski. The body should stay flexed and relaxed with the body facing the direction of travel.
4) As the terrain increases in steepness, additional edge control may be achieved by increasing angulation and the lateral movement of the knee into the hill.
5) Use the tail of the outrigger skis to slow down or stop as in straight running.

Discussion:

The student should master the maneuver thoroughly because he will use the same body position to maintain edge control in making turns. If the skis slide or "wash out" don't spend much time in correction but go on to the hop turn immediately. Go back to the traverse maneuver later to strengthen edging skills.

HOP TURN II

The student is now ready to perform his first "skiing" turn. Although it will appear crude and awkward at first, the principles of unweighting and edge change are basic to our Three Track Teaching Method and will be used throughout the sequence.

NOTE: It will be slightly harder for the student to make the turn on his leg side.

Progression:

1) Choose gentle, smooth terrain.
2) Uphill outrigger is slightly advanced, weighted and positioned approximately half-way between the tip of the leg ski and the toe of the boot.
3) Light pressure is kept on the downhill outrigger to maintain tracking and control. Most of the body's weight is carried by the leg.
4) While skiing in the traverse position with the outriggers apart at shoulder distance and the ankle, knee and upper body flexed, begin the turn by making small hops in a slight up and forward movement to move the tail of the leg ski around.
5) Continue these small hops as you move into and across the fall line.
6) As the ski crosses the fall line, direct the tip of the leg ski toward the arc of the turn keeping the knee constantly pointing in the direction of travel.
7) Steer the leg ski by driving the knee and ankle forward and lowering the body. At the conclusion of the turn, raise the body slightly to the new traverse position.

Discussion:

The hop turn is a beginning turn only and is used to teach basic skills such as edge control and edge change, weight shift, rhythm and the ability to link turns. As the student gains confidence through repetition, turns will become smooth and more fluid. It is important to keep the body weight aligned over the leg throughout this maneuver.

UPHILL CHRISTY

As speed and confidence increase during the Hop Turn, the student will experience his first skidding sensation. Because the body weight is carried on a single ski, skidding occurs easier for the amputee than for two-legged skiers. The instructor's role, then, is to encourage the skid and teach the student to control it. The first elementary christies are so easy to learn, teaching of formal sideslip exercises is not necessary.

Goals: Balance while skidding. Down unweighting.

Progression:

1) With skis across the fall line, outriggers are positioned shoulder-width apart, about half-way between the tip of the leg ski and the toe of the boot.
2) From a traverse, slightly advance and weight the uphill outrigger.
3) Follow an up and forward motion immediately by a down motion. This will release the edges of both the leg ski and outrigger thus permitting slippage of the tail of the leg ski.
4) Steering the leg will encourage and continue the turn. The steering action is applied by bending forward and towards the direction of turn (knee crank).
5) Maintain edge control by increasing angulation during the skidding phase.
6) Keep the upper body quiet and facing the direction of travel.

Discussion:

The Christie phase happens quickly and easily. Control of the resulting skid occurs as the student learns to steer the turn with his lower leg and make minor edging adjustments. Moderate speed and medium steep terrain will aid in this maneuver. As the student learns to initiate with a down unweighting, increase the angle of attack until he can christy from the fall line.

CHRISTY TURN

In this turn, we ask the student to perform a smooth and fluid initiation using elements learned in preceeding exercises with the addition of *Anticipation* as a turning power. Again, because of the dynamics of all body weight being carried on a single ski, the student will have little trouble learning this new and dynamic method to start the skis turning. As in traditional ski techniques, the student will have an easier time with this maneuver as his speed and confidence increases.

Progression:

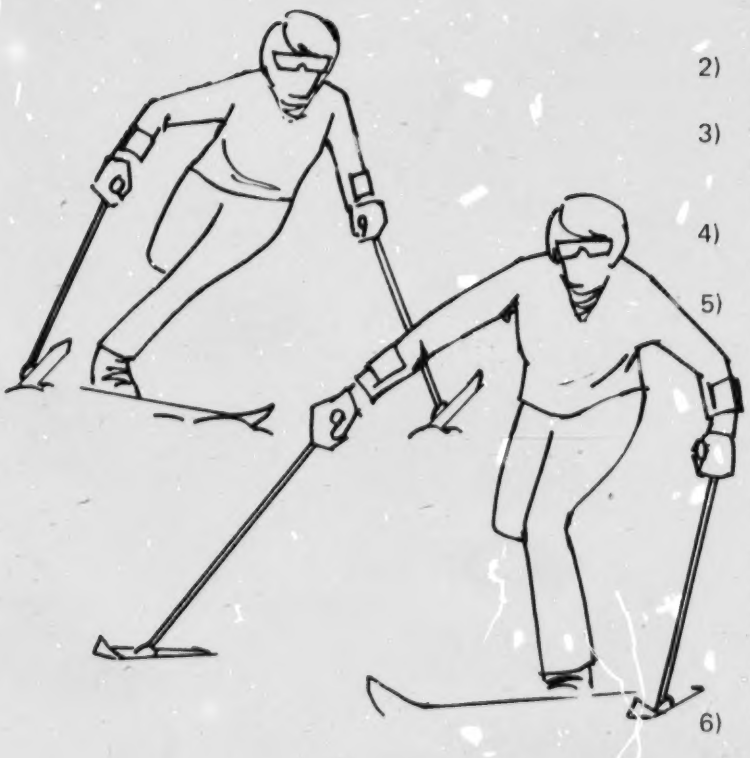
1) From a traverse, have the student perform a series of garlands using "anticipation" as the initiation or propelling device. Use a down-motion to unweight the skis and release the edge.

   NOTE: To develop "anticipation" as a turning power, the student must coil the upper body by facing the downhill outrigger. At the moment of unweighting and edge release, the lower body (foot and leg) will realign with the coiled upper body, thus causing the leg ski to deflect downhill, into the new turn.

2) Practice the garland exercise in both directions varying the speed and angle of the traverse.
3) Experiment with body positioning both forward and back. Teach the student to move down and forward to release the edge.
4) Teach steering with foot and knee to encourage the ski to turn quicker.
5) Now ask the student to follow you as you make a complete turn. From the traverse, mildly increase angulation, face the downhill outrigger and perform a rapid down movement. As the turn begins, increase edging by a lateral knee movement. Encourage a rounded arc by steering with foot and knee.

   NOTE: During the turn, weight is slightly forward and the body is flexed and relaxed. Shoulders (and outriggers) follow the direction of travel. As the turn is completed, skier will raise to a new traverse position.

6) Try long radius, linked turns then vary the arc of each turn as rhythm and smoothness develop.



CHRISTY WITH PRE-TURN

The student should now be ready to learn the subtle skills of improved edge control, rhythm, balance in motion and body position changes. The dynamic edge set together with "anticipation" will also allow the skis to "jet". Properly utilized, the action of jetting will create a faster initiation of a turn and allow the student to make the shorter radius turns needed in steep, bumpy terrain.

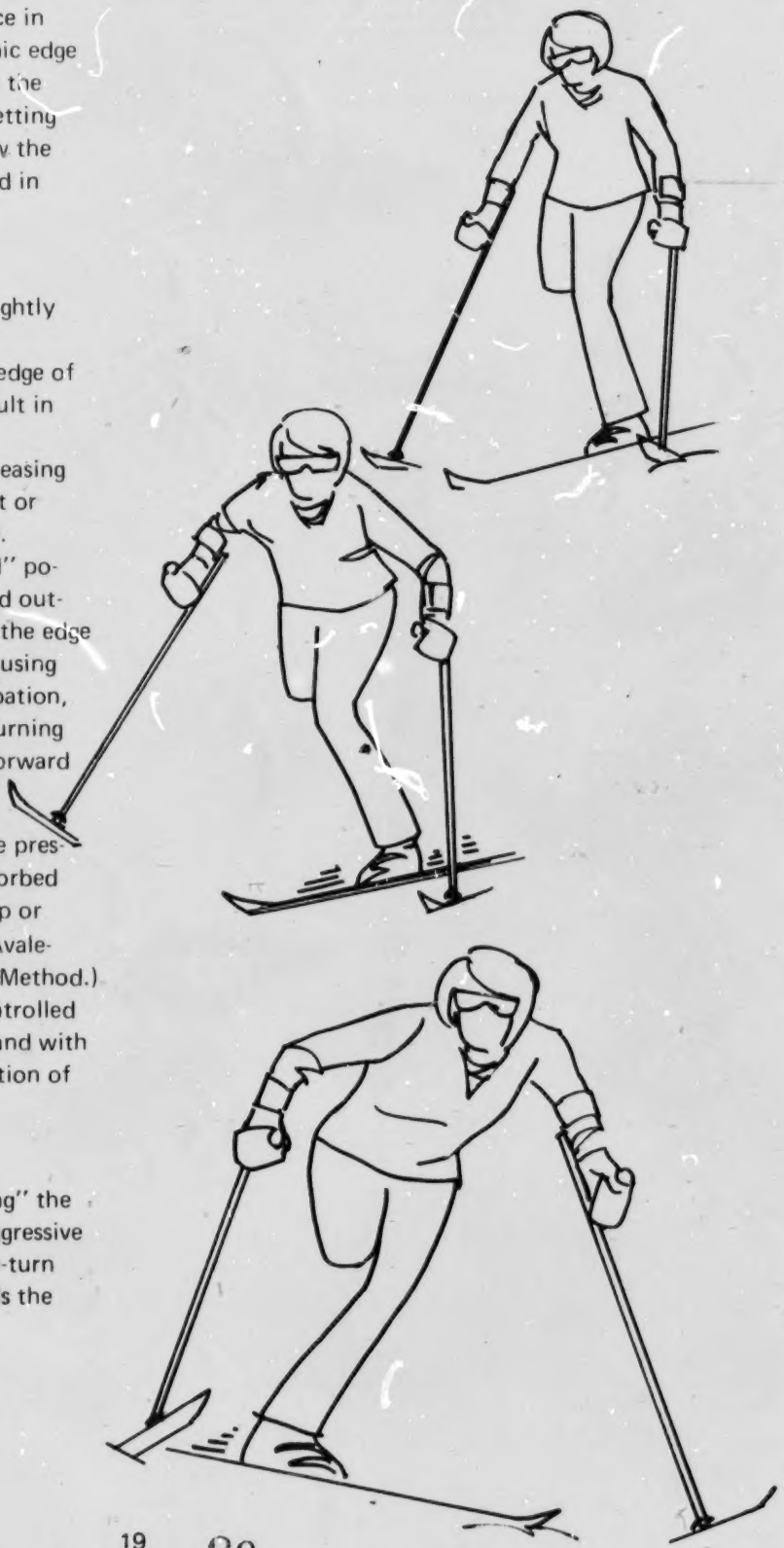
Progression:

1) From a traverse, advance and weight slightly the uphill outrigger.
2) With a rapid down motion, release the edge of the leg ski and outriggers. This will result in displacement of the tail of the leg ski.
3) Halt this displacement by abruptly increasing angulation, thus creating a firm edge set or platform. This is the "checking" phase.
4) With the upper body in an "anticipated" position, release the edge of the leg ski and outrigger. As the pressures created during the edge set are released, a rebound is created causing the skis to "jet" forward. Using anticipation, the "jetting action" is converted into turning power and the skis will tend to shoot forward and into the new turn.

   NOTE: As speed increases, some of the pressures causing the "jetting" must be absorbed by the body so the skier isn't thrown up or back. This can be accomplished with Avalement. (See PSIA's American Teaching Method.)
5) As the turn progresses, the radius is controlled by increasing or decreasing angulation and with steering. Upper body follows the direction of travel.

Discussion:

After learning the skill of pre-turns or "checking" the student now has the necessary tools for fast, aggressive skiing on steep or mogul-filled terrain. The pre-turn also encourages a more rhythmic style and leads the student to shortswing and wedel.



SHORTSWING

Shortswing is a series of successive short-radius parallel christies with the traverse between turns eliminated. It is the distinct edge set of each turn that makes this maneuver effective in steep terrain. Before the student is introduced to shortswing, he should be capable of executing linked christies with a check. In the beginning a gentle slope is best; more difficult terrain may be used as the student's mastery of this maneuver increases.

Progression:

1) From the fall line, the outriggers are placed parallel to the leg ski, half-way between the tip of the ski and the toe of the boot. The weight of the body is carried by the leg; the outriggers are used for balance only.
2) With a rapid down motion, the edges of the outriggers and the leg ski are changed.
3) Simultaneously, the skier increases angulation and moves the knee laterally into the hill, directing the leg ski into the arc of the turn.
4) The edge of the leg ski is set and the upper body is in an "anticipated" position. The resulting rebound will carry the skier into the next turn.
5) Shortswing requires the skier to speed up all basic movements. The direction of the ski is changed by the action of the lower body working against the stabilized mass of the "anticipated" upper body.

Discussion:

The shortswing is an ideal maneuver for skiing moguls. It is important that the skier link his turns rhythmically, using a strong enough edge set and check to control his speed, especially on difficult and mogulled terrain. A static position is avoided by maintaining the body in total flex, emphasising down-unweighting.

After mastering the shortswing, the student is now a sufficiently advanced and competent skier to undertake mogul skiing, powder skiing and racing. Racing competitions among three-track ski groups have become very popular in the United States and Canada, and show signs of becoming even more so. National Amputee Ski Races are held annually in various regions in the United States.

A POSTSCRIPT

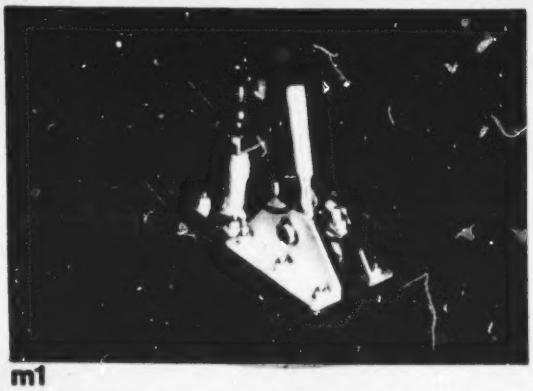
We should like to stress the fact that the Winter Park Amputee skiing technique can be mastered by *anyone* with one sound leg and two arms.

It should also be noted that the normal hazards of skiing are considerably fewer for the amputee than for the two-legged skier. The amputee need never worry about disasters that can result from crossing skis. For the same reason, in his falls, the amputee is not subject to the hazard of two skis twisting and flailing about. Nor need he be concerned about changing two ski edges at one time, as the two-legged skier must. In the entire five years of the Denver Children's Hospital amputee ski program's existence, only one serious injury has occurred.

From extensive experience in both bilateral and unilateral skiing, the author is in a position to assure the amputee that the personal exuberance, satisfaction, and joy in freedom of movement are absolutely identical in both types of skiing. Learning to ski is *not* harder for the amputee; it is less hazardous for him; and the total rewards are always as great and often greater.

We do not consider our method as the last word in amputee skiing. There *is* no last word, for all skiing techniques modify and adapt as new advances are made in equipment and new progress is achieved in trial-and-error teaching and learning. We feel strongly, however, that at the moment the method used by Winter Park students is superior to those used by other amputees, differently trained. At the National Amputee Ski Races in Sun Valley, Idaho, and at Winter Park, Colorado, which hosted competitors from all over the United States and Canada, we saw none with the distinctive fluidity and grace in their total motion as those whom we had trained.

. . . *Two* . . . *Three* . . . *Fasten Your Ski* is a twenty-minute movie, filmed by Len Aiken and sponsored by the Hartford Insurance Company, that shows our amputee skiers in action. Available to groups at no charge, it can be obtained by writing to Department of Rehabilitation, Children's Hospital, Denver, Colorado 80206.



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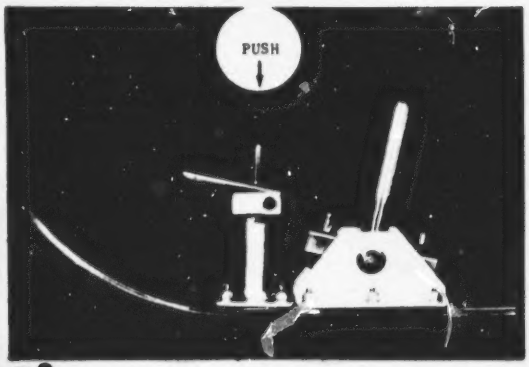

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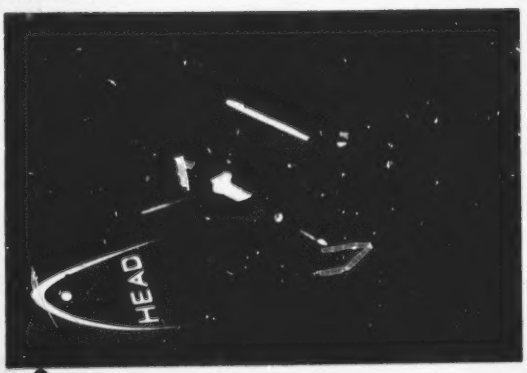

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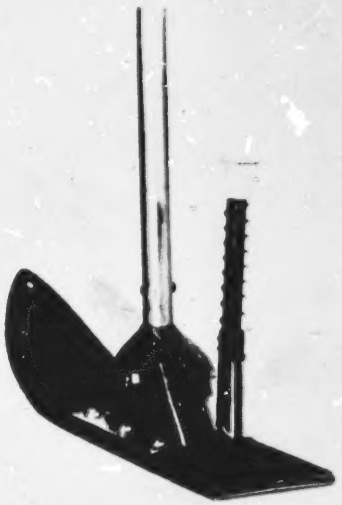
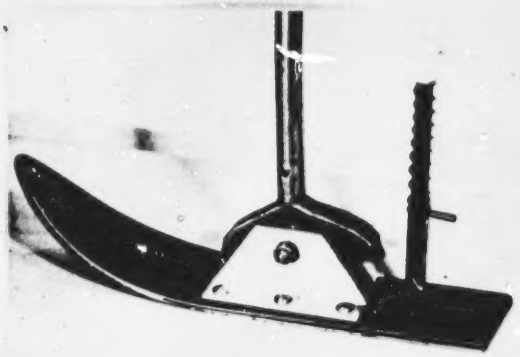
THE OUTRIGGER SKI

◀ MODIFIED
STANDARD ▶

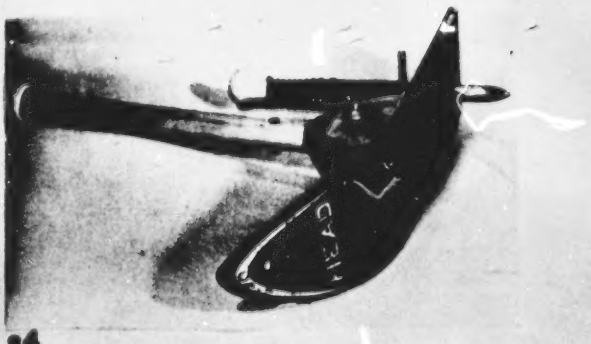
s1



s2



s3

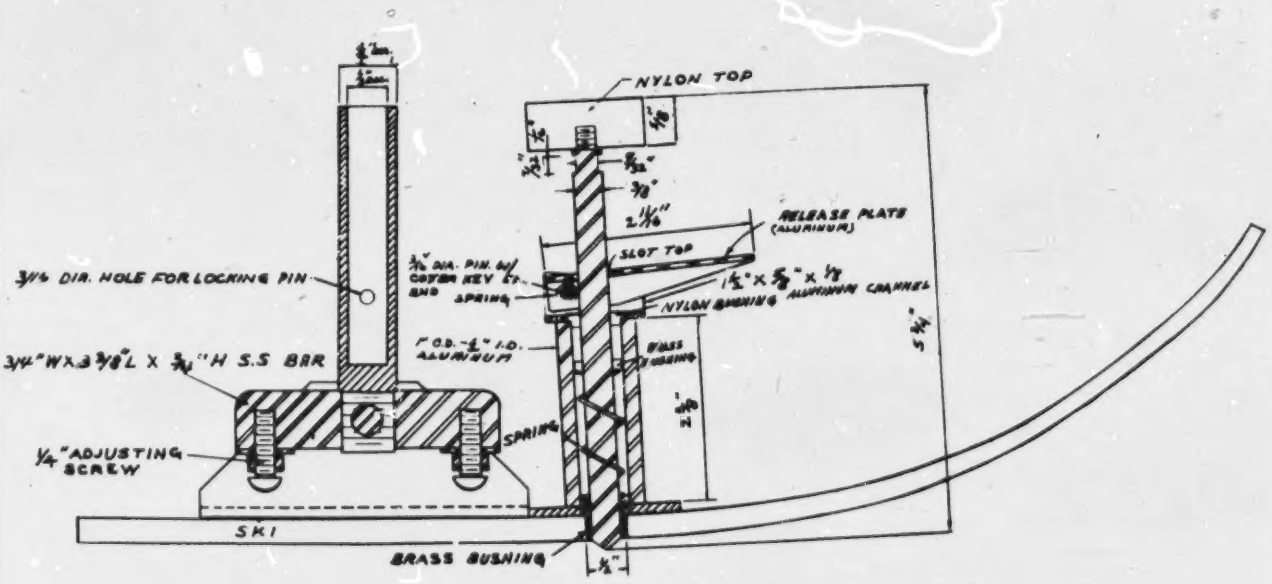


s4

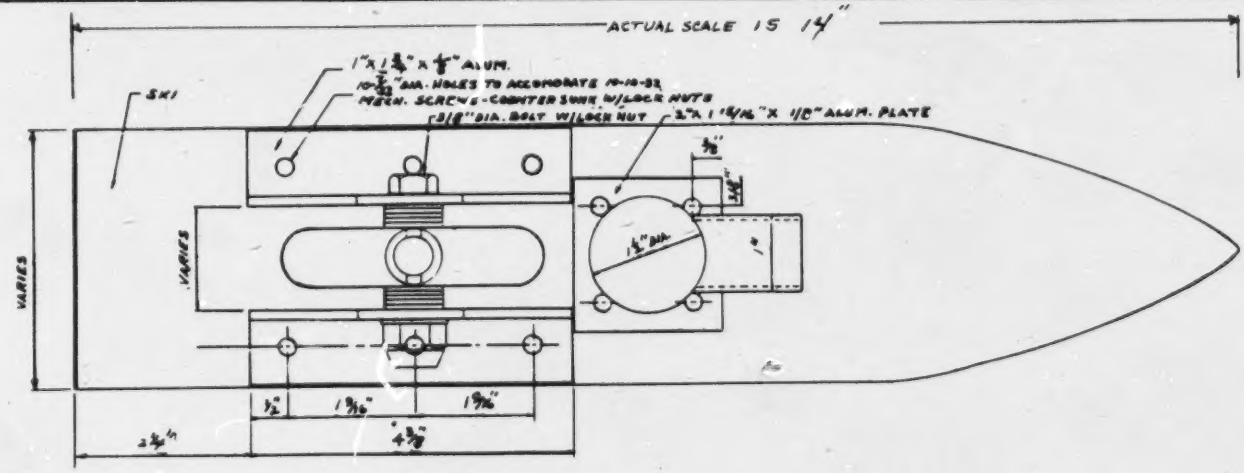
THE OUTRIGGER SKI

GUNNERSON TYPE WITH SPIKE

(Spike can be eliminated since it is used for walking.)

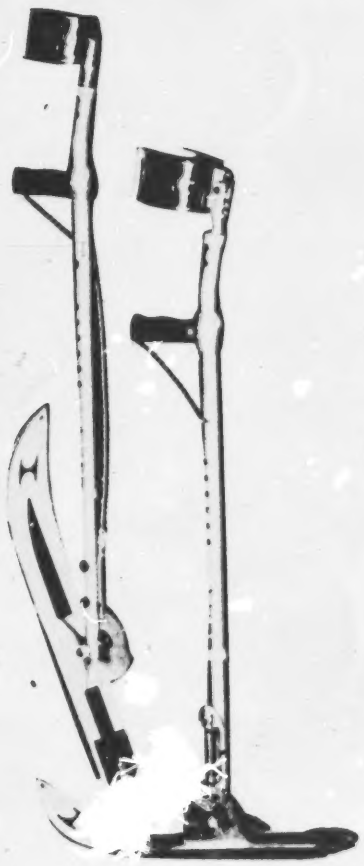


SIDE



TOP

Introducing...
FLIPSKI...
the better outrigger



Finally – an outrigger built for both **skiing** and **walking,** plus an efficient braking action. Just lift the FLIPSKI outrigger off the snow surface, squeeze the hand grip cord and the ski flips up and locks into a vertical position to become a **ski pole** . . . . or a **walking crutch** for use in the chalet and parking lot! Lower the ski by another squeeze of the grip cord. Heel claw has points for gripping ice; also acts as a **brake** when skier lowers the crutch and drags the claw in the snow. Adds greater control and confidence.

Easy to install. Does not harm crutch. On and off in seconds. Adjusts quickly for crutch length.

FLIPSKI fits standard Loftstrand and Preco crutches with 7/8" outside diameter lower tube.

Adapters also available for junior and child size crutches.

ED PAULS • Route 1, Box 615P • Excelsior, Minnesota 55331 • 612-474-9404